MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2215)

PBM0054 – MATHEMATICS

(Foundation in Business)

15 FEBRUARY 2023
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages with **FOUR** questions.
2. Attempt **ALL** four questions. The distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.

QUESTION 1

a. Express the following as a single logarithm and simplify the expression. (5 marks)

$$\frac{3}{2}ln36y^8x^6 - \frac{4}{5}ln243xy^{-10}$$

b. Solve the following equations:

i. $2^{x-1} = 7^{3-4x}$ (5 marks)

ii. $log_4(x-2) + log_4(3x-2) - log_4\,14 = 2$ (5 marks)

c. The number of unique monthly visitors (in thousands) for an online shopping website can be approximated by the function

$$g(x) = 325(1.29^x)$$

Where $x = 1$ corresponds to the month of May, 2021; $x = 2$ corresponds to the month of June, 2021 and so on.
Estimate the number of unique monthly visitors for the following months.

i. September 2021. (2 marks)

ii. Middle of May 2022. (3 marks)

iii. If the model remains accurate, find the month and the year in which the number of unique visitors reach 75,000. (5 marks)

(Round your answer to the nearest integer.)

(Total: 25 marks)

Continued...

QUESTION 2

a. Given $S = \frac{1}{2}\begin{bmatrix} -1 & \sqrt{3} \\ -\sqrt{3} & -1 \end{bmatrix}$, $V = \begin{bmatrix} 1 & 2 \\ 0 & -2 \end{bmatrix}$.

i. Find S^3. (6 marks)

ii. Find constant a and b, such that $\frac{3}{10}V^2 = aV - \begin{bmatrix} b & 0 \\ 0 & b \end{bmatrix}$. (6 marks)

b. Solve the following system of linear equations using the inverse of coefficient matrix.

$$x + 2y + 2z - 5 = 0$$
$$2x + 7z = 19 - 4y$$
$$-5y - 2z - 8 = 2x$$

(13 marks)

(Total: 25 marks)

QUESTION 3

a. Find y' for the given functions and simplify the answers.

i. $y = 0.7x^{\frac{2}{21}} + \frac{20}{3\sqrt[5]{x^4}} - 16x^{-4} - 9\pi$ (4 marks)

ii. $y = \left(\frac{3x+1}{\sqrt{x}}\right)^3$ (5 marks)

iii. $y = (7 - 3x)^5(x^3 + 6)^7$ (5 marks)

b. Given $f(x) = \frac{12}{(5x^3 - 4x^2 + 6)^2}$.

i. Find $f'(x)$ and simplify the answer. (3 marks)

ii. Hence find the equation of the tangent line to the curve $f(x)$ at the point $x = 1$. (3 marks)

Continued...

c. The cost of producing x units of a particular commodity is

$$C(x) = \frac{1}{3}x^2 + 4x + 53 \quad Ringgit,$$

and the production level t hours for a particular production run is

$$x(t) = 0.2t^2 + 0.03t \quad units.$$

At what rate is cost changing with respect to time, $\frac{dC}{dt}$ after 4 hours? (5 marks)

(Total: 25 marks)

QUESTION 4

a. Evaluate the following integrals.

i. $\int \left(4\sqrt{x} - 2x^{-3}\right)\left(\sqrt[5]{x^3} - \frac{1}{8\sqrt{x}}\right) dx$ (6 marks)

ii. $\int \frac{(21x^2 - 12x^4) - (28x - 16x^3)}{(\sqrt{7} - 2x)} dx$ (6 marks)

iii. $\int_{-1}^{2} \frac{3x + 6}{(x^2 + 4x + 5)^{\frac{1}{6}}} dx$ (6 marks)

b. The promoters of a travel fair estimate that t hours after the event starts at 9.00 am ($t = 0$), visitors will be entering the fair at the rate of

$$N'(t) = -4(t + 2)^3 + 54(t + 2)^2$$

people per hour. How many people, $N(t)$ will enter the fair between 10am to noon? (7 marks)

(Total: 25 marks)

End of Paper